STATEMENT OF

DR. GERALD D. LOVE
ASSOCIATE ADMINISTRATOR FOR RESEARCH AND DEVELOPMENT
FEDERAL HIGHWAY ADMINISTRATION
DEPARTMENT OF TRANSPORTATION

BEFORE THE
HOUSE SCIENCE AND TECHNOLOGY COMMITTEE
SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND COMMUNICATIONS

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I appreciate this opportunity to meet with the Subcommittee this morning to discuss the research and development program of the Federal Highway Administration and also the research and development efforts that are carried out at the State level by the State highway agencies.

The traditional State-Federal partnership, which is the foundation of the Federal-Aid Highway Program, is also carried over into the research and development program. This results in the research and development programs of the Federal Highway Administration being unique in research topic selection, in management, and in translating research results into practice.

Approximately half of the resources in the research program is derived from the 1-1/2 percent set-asides in the State

apportionments from the Highway Trust Fund for highway planning and research under Section 307(c) of Title 23. The remainder of the funding is appropriated under Section 307 of Title 23 and Section 403 of the Highway Safety Act and is managed directly by our Offices of Research and Development. Our understanding of the legislation providing research funds to the States is that the intent was in part to provide resources for solving local technical problems. Our approach to management of these funds reflects this concept, while at the same time exerting sufficient guidance to avoid unnecessary duplication of effort and to ensure coordination of State efforts with those of our own contract program and staff efforts when the problems are national in significance.

For the purposes of focusing available resources on significant problems and assuring that all highway research and development is coordinated and that duplication of effort is avoided, an overall program structure has been established. This structure, designated as the Federally Coordinated Program of Research and Development in Highway Transportation, is continually updated to reflect the most urgent problems facing local, State, and Federal highway officials.

The problems to be incorporated into projects under this program are selected by a process involving the State highway agencies, the Federal Highway Administration field and operating offices, and national professional associations related to the highway program.

Problem areas may be identified by all segments of the highway community. In addition to the many informal contacts through committees of AASHTO, the Transportation Research Board, and other national organizations, there is a formal biennial solicitation of the State highway agencies. The solicitation is conducted by the Office of Highway Safety to identify safety problems needing attention. The opportunities for input to the program extend to the Governors' Safety Representatives and to city and county traffic officials. A similar solicitation is conducted by the Associate Administrator for Engineering and Traffic Operations for all other problem areas. Inputs obtained through these solicitations and informal contacts are considered as well as the requirements of new legislation, direction from the Federal Highway Administrator, and the Office of the Secretary in selecting those problem areas which become formal projects in the Federally Coordinated Program.

Federal Highway Administration research and development personnel are responsible for coordinating these projects, which typically include contract research, staff research, and research studies by the State highway agencies under the 1-1/2 percent HPR funding arrangements. Research and development personnel plan the attack on the problem, estimate the budget requirements for the project, persuade individual State highway research organizations

to participate, and then coordinate these efforts with the contract program to obtain appropriate solicitations. A typical project in the program runs from 3 to 6 years and may contain as many as 30 or 40 contracts and perhaps 50 or 60 studies by State highway agencies. There may also be staff studies in our own laboratories and special studies under the National Cooperative Highway Research Program administered by the Transportation Research Board, National Academy of Sciences. The latter program is funded by a tripartite agreement between the participating States, the Federal Highway Administration and the Transportation Research Board, with funding derived from the 1-1/2 percent monies of Section 307(c).

In terms of content, the Federally Coordinated Program is divided into six active categories. These deal with safety, reduction of traffic congestion, environmental considerations, improved and substitute materials, pavement and bridge design and life expectancy, and improvement of construction and maintenance management and methods. In support of this program, there is a strong implementation and technology sharing program to disseminate research outputs to the highway community. Currently, the program contains approximately 50 major projects with a total of some 1,300 studies, including over 450 current FHWA contracts, about 750 State highway agency studies, 40 NCHRP studies, and 60 in-house staff studies conducted in our own laboratories. This count does not include the State/Federal-aid

research studies directed at local problems nor NCHRP studies unrelated to the projects selected for inclusion in the Federally Coordinated Program. In FY 1979, the total funding amounted to $49 million with $22.5 million contract funds, $21 million Federal-aid studies in the States, $4.0 million in NCHRP, and $1.5 million in in-house staff studies.

The indicated funding level of contract funds includes $2.25 million administered by the Office of Program and Policy Planning. The technology sharing program of the Federal Highway Administration is designed to ensure that outputs of the Research and Development program, as well as new technology from other sources applicable to highway activities, will be incorporated into our operations as rapidly as possible. In addition to the Implementation Division of the Offices of Research and Development, there are three other Federal Highway Administration components involved in this program: Under the National Experimental Evaluation Program (NEEP), administered by the Office of Highway Operations, States are encouraged to make experimental trial of new methods, materials and systems as a part of their normal design and construction program; the National Highway Institute provides training in new technologies for State highway agencies; and, where appropriate, the Research and Development Demonstration Program (Region 15) conducts physical demonstrations or constructs demonstration projects. The latter program is funded at $2.8 million in the current fiscal year.

The Offices of Research and Development have 212 full-time and 21 part-time employees engaged in the management of this program and the conduct of the staff studies in our own laboratories at the Fairbank Highway Research Station, McLean, Virginia. The professional disciplines represented include chemistry, geology, physics, metallurgy, sociology, community planning, psychology, mathematics, statistics, wildlife biology, and electrical, mechanical and civil engineering. The latter category accounts for about half of the total with expertise in structures, materials, hydraulics and hydrology, traffic engineering, and highway design and planning. The educational level has been considerably upgraded in the past 10 years, with 29 of the staff now holding doctorates, and about half of the remaining holding Master's degrees.

Approximately one-third of the FHWA staff and administrative contract program is devoted to highway safety. Highway safety research and development seeks to help State and local highway agencies reduce accident fatalities, injuries and property damage. Safety improvements often produce additional, non-safety benefits such as reduction of traffic congestion and substantial fuel savings. Federal Highway Administration safety research focuses on highway design, traffic engineering accident investigation, and the special problems of selected highway conditions and users.

An example of the hardware developed in this program is the family of bridge rails developed to replace substandard bridge railings. Five standard retrofit concepts were developed for upgrading the safety performance of the typical substandard bridge railings. These retrofit concepts were verified by full-scale crash tests. Retrofit bridge railings for functionally obsolete bridges are being developed to minimize the possibility of a bridge collapse by preventing vehicle impacts with critical structural members. Such railings will permit many of these bridges to remain in service until replacement is possible.

Research in traffic operations is producing new techniques for increasing the operational efficiency of existing highways and effective designs for constructing new facilities. Our research concentrates on improving traffic operations by optimizing traffic flow on freeways, developing traffic management plans and motorist information systems, and applying advanced technology to various types of roadways.

The Integrated Motorist Information System (IMIS) to improve traffic flow and control along a freeway corridor was developed under this area of research. The results are now going into a full-scale demonstration on Long Island, funded under Section 154 of the 1978 Surface Transportation Assistance Act.

A growing awareness of the impact of highway systems on the environment has resulted in a concerted effort to protect the environment from adverse effects of highways. To determine potential environmental impacts, the complex interaction between highways and biophysical and social environments must be understood. Our environmental research addresses a broad spectrum of environmental disciplines: Water quality, air quality, noise abatement, general ecological problems, and socio-economic factors.

Output from air quality research produced procedures for incorporating air quality considerations into the highway planning and design process. These results are of particular interest to metropolitan planning organizations due to their increased involvement in transportation/air quality planning mandated by the Federal Clean Air Act Amendments of 1977.

Nationally important highway materials problems are being investigated in a very active but selective materials research program. The Federal Highway Administration focuses on improving materials performance in several significant areas including bridge structures, embankments, and pavements, including improved corrosion control.

Significant progress has been made in finding substitute materials to reduce our dependence on petroleum derived asphalt.

Economical procedures have been developed to plasticize sulfur and thus create a revolutionary new binder system which has the potential as a complete replacement for asphalt or portland cement. All plasticizers can be made from non-petroleum sources. Laboratory testing has been successful and a 750-foot pavement test section was constructed without problems in 1978 in Texas using conventional highway construction equipment. Research and evaluation will continue in this most significant area.

It should be noted that this is also an example of research that was initiated in our New Concepts and Systems Characterization Program prior to being funded as a separate project. In the New Concepts area, we make pilot studies and assessments to determine if an area of research is promising enough to be explored further.

The increasing importance of providing cost-effective, low maintenance, durable structures emphasizes the demand for better design and construction methods for tunnels, highways and bridges. Structural design criteria for extending the service life of these structures and improving the capability to withstand natural hazards of earthquake, wind, and flood are Federal Highway Administration goals.

It is estimated that it will cost $23 billion to replace the inadequate bridges in this country. We have already developed modular

and precast concrete designs which may be used to rapidly reconstruct deteriorated bridge decks. Ongoing and future research will result in improved inspection devices and methods for more reliable assessment of the structural integrity of in-service bridges and methods for extending the safe life of in-service bridges.

Maintenance covers a broad range of activities and consumes considerable resources and manpower; thus optimizing maintenance activities is of the utmost importance. Optimizing maintenance activities through value engineering studies, equipment development and application, and management and administration is key in our research and development program.

Completed value engineering projects include studies on effective snow and ice control, shoulder maintenance, pavement repair and patching. A total of 29 State highway agencies were involved with these studies and the improvements recommended have resulted in an estimated savings of more than $8 million.

The cost/benefit ratios of our research program are normally quite high and extend for many years into the future. For example, techniques developed for making new concrete bridge decks virtually impervious to damage from deicing chemicals, when fully deployed, will eventually eliminate the $50 million per year now expended to

repair such damage. Roadside safety hardware such as impact attenuators, improved guardrail and breakaway supports are saving lives. Analysis of 392 accidents in 33 States indicated that the presence of crash cushions reduced the number of serious injury and fatal accidents by 75 percent. As a result of 393 hits on crash cushions in New York at least 20 fatalities and serious injuries have been avoided. Rhode Island has installed crash cushions at 34 locations within the State and estimates that these devices have saved at least 44 lives and 58 injuries over the last 7 years. There are approximately 10,000 impact attenuator installations in the United States today. It is conservatively estimated that these installations have the potential to save over 2,200 lives and 2,600 serious injuries annually.

Improved guardrail has also been shown to be an effective accident countermeasure. The State of Michigan has undertaken a 7-year program to upgrade guardrail on its freeway system. As a result, fatal guardrail accidents were reduced from 83 annually to 25 annually by the end of the 7th year although the number of guardrail accidents remained about the same. Installing breakaway sign supports on the same Michigan freeways resulted in a 50 percent reduction in fatal accidents involving signs. Breakaway supports for signs, utility poles, and highway lighting offer a great potential for reducing the Nation's annual fatality toll. Nonbreakaway sign and light poles

and utility poles are involved in over 2,000 fatal accidents annually.

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This concludes my statement which I hope has addressed a number of your concerns. I will be pleased to answer any questions you may have. Thank you for this opportunity to discuss our research and development efforts with you.

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